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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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06/07/2005

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EXAMINER:

JONES, JAMES

ART UNIT

PAPER NUMBER

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06/25/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,898	Applicant(s) GRIFFITH ET AL.	
	Examiner James C. Jones	Art Unit 2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on the amendment filed on 4/2/2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-13, 20, 22 and 24 is/are rejected.
- 7) ☒ Claim(s) 8, 14-19, 21, 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7, 9, 20, 22 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Shen (6236490) hereafter '490.

'490 discloses the limitations therein including the following:

Regarding claim 1 '490 discloses a deformable mirror (abstract) comprising: a passive substrate layer having a reflective surface provided thereon (fig.2, col.4, ln.23-45 "18" as the "passive substrate" and "18a" as the "reflective surface"); a first layer of actively deformable material, said first layer having a thickness and attached to the passive substrate layer, for deforming the mirror as a result of transverse expansion or contraction of the deformable material under the influence of a field applied across said thickness (fig.2, col. 4, ln. 1-21 "20" as the "first layer"); and a linear actuator coupled to one of said layers that is operable to further deform the mirror (fig.2, abstract, col. 3, ln. 57-59 col. 4, ln.30-47 "20" as the "linear actuator").

Regarding claim 2 '490 discloses a deformable mirror according to claim 1, wherein the first layer of actively deformable material is bonded to the passive substrate layer (fig.2 col. 5, ln. 1-4).

Regarding claim 3 '490 discloses a deformable mirror according to claim 1, comprising a second layer of actively deformable material bonded to the first layer of actively deformable material (fig.4, col. 3, ln. 48-51 "14" as the "second layer").

Regarding claim 4 '490 discloses a deformable mirror according to claim 1, comprising a plurality of linear actuators, each of said actuators coupled to one of said layers (fig. 2, abstract, col. 3, ln. 47-64 "16" and "20" as the "plurality of actuators").

Regarding claim 5 '490 discloses a deformable mirror according to claim 4, wherein the linear actuators correct lower order Zernike modes (col. 4, ln. 1-12 "lower frequency wavefront errors" as the "lower order Zernike modes").

Regarding claims 6 and 22 '490 discloses a deformable mirror according to claim 1, wherein the first layer of actively deformable material is segmented and the segments are arranged to correct higher order Zernike modes (fig. 3a or 3b, col. 4, ln. 1-12, col. 4, ln. 48-67 "higher frequency wavefront errors" as the "higher order Zernike modes").

Regarding claim 7 '490 discloses a deformable mirror according to claim 1, wherein the first layer of actively deformable material comprise piezoelectric material and the field is an electric field (col. 4, ln. 17-18 "PMN" as the "piezoelectric material").

Regarding claim 9 '490 discloses a deformable mirror according to claim 1, wherein the linear actuator or actuators comprise magnetostrictive or electrostrictive material (col. 4, ln. 17-19).

Regarding claims 20 and 24 '490 discloses a method of correcting phase variations in a beam of electromagnetic radiation incident upon a deformable mirror according to claim 3, wherein the linear actuator is moved to correct Zernike modes at

or below a threshold order and the layer of deformable material are arranged to correct Zernike modes above the threshold order (fig. 2, col. 4, ln. 1-12).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over shen (6236490) hereafter '490 in view of Bacich (4733945) hereafter '945.

Regarding claim 10 '490 discloses as set forth above but does not specifically disclose a deformable mirror holder for a deformable mirror according to claim 1, wherein the holder comprises a body with a central aperture for receiving the deformable mirror, the central aperture being defined by a plurality of flexible beams, with each flexible beam having an end shaped to provide a supporting surface and a flexible portion that connects and end of the beam to the body. '945 teaches that in an optical system having an expanding optical element (col. 6, ln. 25-40) that it is desirable to have an optical element holder wherein the holder comprises a body with a central aperture for receiving the deformable mirror (fig. 1), the central aperture being defined by a plurality of flexible beams (fig. 1, 3 and 4, col. 4, ln. 13-16, "22" "23" "24" "24" as the "plurality of flexible beams"), with each flexible beam having an end shaped to provide a supporting surface and a flexible portion that connects and end of the beam to the body (fig. 1, 3, and 4) for the purpose of providing stability to the optical element during

expansion and contraction (col. 6, ln. 60-65). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have used the optical element holder as taught in '945, as an optical element holder for holding the deformable mirror set forth in '490 since '945 teaches that in an optical system having an expanding optical element that it is desirable to have an optical element holder wherein the holder comprises a body with a central aperture for receiving the deformable mirror, the central aperture being defined by a plurality of flexible beams, with each flexible beam having an end shaped to provide a supporting surface and a flexible portion that connects an end of the beam to the body for the purpose of providing stability to the optical element during expansion and contraction.

Regarding claims 11, 12, and 13 '490 and '945 disclose and teach as set forth above and '945 further teaches that in an optical system having an expanding optical element (col. 6, ln. 25-40) that it is desirable to have a deformable mirror holder according to claim 10, wherein the ends of the flexible beams are co-joined to form a unitary structure shaped to provide a supporting surface (fig. 4); wherein the ends of the beams lie in the plane of the body of the holder such that, in use, the deformable mirror is received within the body of the holder (fig. 2a and 4); and wherein at least one beam is generally L-shaped (fig. 4) such that one leg of the L-shape provides the flexible portion (fig. 4, col. 6, ln. 60-66 "52" as the "flexible portion") and the other leg of the L-shape provides the supporting surface of the end of the beam (fig. 4, col. 5, ln. 4-5 "29" as the "supporting surface") for the purpose of providing stability to the optical element during expansion and contraction (col. 6, ln. 60-65). Therefore, it would have been

Art Unit: 2873

obvious to a person of ordinary skill in the art at the time the invention was made to have a deformable mirror holder wherein the ends of the flexible beams are co-joined to form a unitary structure shaped to provide a supporting surface; wherein the ends of the beams lie in the plane of the body of the holder such that, in use, the deformable mirror is received within the body of the holder; and wherein at least one beam is generally L-shaped such that one leg of the L-shape provides the flexible portion and the other leg of the L-shape provides the supporting surface of the end of the beam as taught in '945, as an optical element holder for holding the deformable mirror set forth in '490 since '945 further teaches that in an optical system having an expanding optical element that it is desirable to have a deformable mirror holder according to claim 10, wherein the ends of the flexible beams are co-joined to form a unitary structure shaped to provide a supporting surface; wherein the ends of the beams lie in the plane of the body of the holder such that, in use, the deformable mirror is received within the body of the holder; and wherein at least one beam is generally L-shaped such that one leg of the L-shape provides the flexible portion and the other leg of the L-shape provides the supporting surface of the end of the beam for the purpose of providing stability to the optical element during expansion and contraction.

Allowable Subject Matter

Claims 8,14-19, 21, and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: with respect to the allowable claims, none of the prior art either alone or in combination disclose or teach of the claimed combination of limitations to warrant a rejection under 35 USC 102 or 103. Specifically, in reference to claim 8, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "linear actuator is coupled directly to the passive substrate layer through one aperture in the first layer of actively deformable material".

Regarding claims 14 and 19, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "internal corner of the L-shaped beam has a shoulder that extends part of the way along both legs of the L-shape".

Regarding claims 15-17, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "plurality of flexible beams are arranged around the entire aperture".

Regarding claim 18, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "peripheral edge of the deformable mirror is supported from below by one leg of an L-shaped beam and is supported from the side by the other leg of the L-shaped beam".

Regarding claim 21, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "actuator is moved to correct the first and second order Zernike modes and the deformable material is moved to correct third and higher order Zernike modes".

Regarding claim 23, none of the prior art either alone or in combination disclose or teach of the claimed deformable mirror holder specifically including, as the distinguishing features in combination with the other limitations, the claimed "linear actuator is coupled to the passive substrate layer by means of at least one aperture in the first and second layers".

Response to Arguments

Applicant's arguments filed 4/2/2007 have been fully considered but they are not persuasive.

I. The applicant argues that the Shen reference does not specify a deformable material for deforming the mirror as a result of transverse expansion or contraction of the deformable material under the influence of a field applied across said thickness.

II. The applicant argues that there is believed no disclosure in Bachich of a deformable mirror comprised of a passive substrate layer, a first layer of actively deformable material and a linear actuator, or the additional details of the mirror holder having a plurality of flexible beams.

Both arguments have been fully considered.

In regards to argument I Shen discloses the first layer of deformable material "20" as Lead/Magnesium/Niobate (PMN) which is a electrostrictive actuator. PMN is a non-poled ceramic with displacement proportional to the square of the applied voltage. An electric field separates the positively and negatively charged ions, changing the dimensions of the cell and resulting in an expansion. Therefore, the first layer is a layer of deformable material that will expand when a field is applied to its thickness.

Regarding argument II the Bacich reference does not disclose a deformable mirror comprised of a passive substrate layer, a first layer of actively deformable material and a linear actuator because Bacich was cited as prior art to show a teaching of an optical element holder having a plurality of flexible beams for the purpose of providing stability to the optical element during expansion and contraction. Furthermore, Bacich teaches a plurality (more than one) of flexible beams (col. 4, ln. 13, col. 6, ln. 60-64 the cantilever flexures "22" "23" "24" "25" as the "flexible beams").

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

Art Unit: 2873

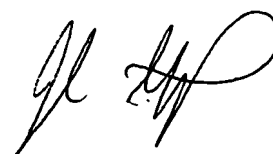
shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James C. Jones whose telephone number is (571) 270-1278. The examiner can normally be reached on Monday thru Friday, 8 a.m. to 5 p.m. est. time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Mack can be reached on (571) 272-2333. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

James C. Jones 6/18/2007
JCJ



JORDAN SCHWARTZ
PRIMARY EXAMINER